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ABSTRACT

Respondents filed in the Patent Office an application for an invention which was described as being related to the processing of data by program and more particularly to the programmed conversion of numerical information in general purpose digital computers. The patent sought is on a method of programming a general purpose digital computer to convert signals from binary coded decimal form into pure binary form. The claims were not limited to any particular art or technology, apparatus or machinery, or end use. They purported to cover any use of the claimed method in a general purpose digital computer. The question is whether the method described and claimed is a process within the meaning of the Patent Act. The Court recognized that if such programs are to be patentable, considerable problems are raised which only committees of Congress can manage with their broad powers of investigation. (Author/SJ)

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(Slip Opinion)

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SUPREME COURT OF THE UNITED STATES

No. 71-485

Robert Gottschalk, Acting Commissioner of Patents, Petitioner, *v.* Gary R. Benson and Arthur C. Tabbot.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

[November 20, 1972]

MR. JUSTICE DOUGLAS delivered the opinion of the Court.

Respondents filed in the Patent Office an application for an invention which was described as being related "to the processing of data by program and more particularly to the programmed conversion of numerical information" in general purpose digital computers. They claimed a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals. The claims were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use. They purported to cover any use of the claimed method in a general purpose digital computer of any type. Claims 8 and 13 [1] were rejected by the Patent Office but sustained by the Court of Customs and Patent Appeals, 441 F. 2d 682. The case is here on a petition for a writ of certiorari. 405 U. S. 915.

The question is whether the method described and claimed is a "process" within the meaning of the Patent Act.[2]

[1] They are set forth in the Appendix to this opinion.

[2] 35 U. S. C. § 100 (b) provides:

"The term 'process' means process, art or method, and includes a

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A digital computer, as distinguished from an analogue computer, is that which operates on data expressed in digits, solving a problem by doing arithmetic as a person would do it by head and hand.[3] Some of the digits are stored as components of the computer. Others are introduced into the computer in a form which it is designed to recognize. The computer operates then upon both new and previously stored data. The general purpose computer is designed to perform operations under many different programs.

The representation of numbers may be in the form of a time-series of electrical pulses, magnetized spots on the surface of tapes, drums, or discs, charged spots on cathode ray tube screens, or the presence or absence of punched holes on paper cards, or other devices. The method or program is a sequence of coded instructions for a digital computer.

The patent sought is on a method of programming a general purpose digital computer to convert signals from binary coded decimal form into pure binary form. A procedure for solving a given type of mathematical problem is known as an "algorithm." The procedures set forth in the present claims are of that kind; that is to say, they are a generalized formulation for programs to solve mathematical problems of converting one form of numerical representation to another. From the generic formulation, programs may be developed as specific applications.

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new use of a known process, machine, manufacture, composition of matter, or material."

35 U. S. C. § 101 provides:

"Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."

[3] See Benray, Understanding Digital Computers (1946) p. 4.

The decimal system uses as digits the 10 symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The value represented by any digit depends, as it does in any positional system of notation, both on its individual value and on its relative position in the numeral. Decimal numerals are written by placing digits in the appropriate positions or columns of the numerical sequence, *i. e.*, "unit" (10^0), "tens" (10^1), "hundreds" (10^2), "thousands" (10^3), etc. Accordingly, the numeral 1492 signifies $(1\times10^3)+(4\times10^2)+(9\times10^1)+(2\times10^0)$.

The pure binary system of positional notation uses two symbols as digits—0 and 1, placed in a numerical sequence with values based on consecutively ascending powers of 2. In pure binary notation, what would be the tens position is the two position; what would be hundreds position is the fours position; what would be the thousands position is the eights. Any decimal number from 0 to 10 can be represented in the binary system with four digits or positions as indicated in the following table.

	Shown as the sum of powers of 2								
	2^3		2^2		2^1		2^0		
Decimal	(8)		(4)		(2)		(1)		Pure Binary
0 =	0	+	0	+	0	+	0	=	0000
1 =	0	+	0	+	0	+	2^0	=	0001
2 =	0	+	0	+	2^1	+	0	=	0010
3 =	0	+	0	+	2^1	+	2^0	=	0011
4 =	0	+	2^2	+	0	+	0	=	0100
5 =	0	+	2^2	+	0	+	2^0	=	0101
6 =	0	+	2^2	+	2^1	+	0	=	0110
7 =	0	+	2^2	+	2^1	+	2^0	=	0111
8 =	2^3	+	0	+	0	+	0	=	1000
9 =	2^3	+	0	+	0	+	2^0	=	1001
10 =	2^3	+	0	+	2^1	+	0	=	1010

The BCD system using decimal numerals replaces the character for each component decimal digit in the decimal numeral with the corresponding four-digit binary

numeral, shown in the righthand column of the table. Thus decimal 53 is represented as 0101 0011 in BCD, because decimal 5 is equal to binary 0101 and decimal 3 is equivalent to binary 0011. In pure binary notation, however, decimal 53 equals binary 110101. The conversion of BCD numerals to pure binary numerals can be done mentally through use of the foregoing table. The method sought to be patented varies the ordinary arithmetic steps a human would use by changing the order of the steps, changing the symbolism for writing the multiplier used in some steps, and by taking subtotals after each successive operation. The mathematical procedures can be carried out in existing computers long in use, no new machinery being necessary. And, as noted, they can also be performed without a computer.

The Court stated in *MacKay Co.* v. *Radio Corp.*, 306 U. S. 86, 94, that "While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be." That statement followed the long-standing rule that "An idea of itself is not patentable." *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507. "A principle, in the abstract, is a fundamental truth; an original cause; a motive; and these cannot be patented, as no one can claim in either of them an exclusive right." *LeRoy* v. *Tatham*, 14 How. 156, 175. Phenomena of nature, though just discovered, mental processes, abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work. As we stated in *Funk Bros. Seed Co.* v. *Kalo Co.*, 333 U. S. 127, 130, "He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from

the application of the law of nature to a new and useful end." We dealt there with a "product" claim, while the present case deals only with a "process" claim. But we think the same principle applies.

Here the "process" claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure-binary conversion. The end use may (1) vary from the operation of a train to verification of drivers' licenses to researching the law books for precedents and (2) be performed through any existing machinery or future-devised machinery or without any apparatus.

In *O'Reilly* v. *Morse*, 15 How. 62, Morse was allowed a patent for a process of using electro-magnetism to produce distinguishable signs for telegraphy. *Id.*, at 111. But the Court denied the eighth claim in which Morse claimed the use of "electro-magnetism, however, developed for marking or printing intelligible characters, signs, or letters, at any distance." The Court in disallowing that claim said, "If this claim can be maintained, it matters not by what process or machinery the result is accomplished. For aught that we now know some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated—less liable to get out of order—less expensive in construction, and its operation. But yet if it is covered by this patent the inventor could not use it, nor the public have the benefit of it without the permission of this patentee." *Id.*, at 113.

In *The Telephone Cases*, 126 U. S. 1, 534, the Court explained the *Morse* case as follows: "The effect of that decision was, therefore, that the use of magnetism as a motive power, without regard to the particular process

with which it was connected in the patent, could not be claimed, but that its use in that connection could." Bell's invention was the use of electric current to transmit vocal or other sounds. But the claim was not "for the use of a current of electricity in its natural state as it comes from the battery, but for putting a continuous current in a closed circuit into a certain specified condition suited to the transmission of vocal and other sounds, and using it in that condition for that purpose." 126 U. S., at 534. The claim, in other words, was not "one for the use of electricity distinct from the particular process with which it is connected in his patent." *Id.*, at 535. The patent was for that use of electricity "both for the magnetic and variable resistance methods." *Id.*, at 538. Bell's claim in other words, was not one for all telephonic use of electricity.

In *Corning* v. *Burden,* 15 How. 252, 267–268, the Court said "One may discover a new and useful improvement in the process of tanning, dyeing, etc. irrespective of any particular form or mechanical device." The examples given were the "arts of tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores." *Id.*, at 267. Those are instances, however, where the use of chemical substances or physical acts such as temperature control change articles or materials. The chemical process or the physical acts which transform the raw material are, however, sufficiently definite to confine the patent monopoly within rather definite bounds.

Cochran v. *Deener,* 94 U. S. 780, involved a process for manufacturing flour so as to increase its quality. The process first separated the superfine flour and then removed impurities from the middling by blasts of air, reground the middlings, and then combined the product with the superfine. *Id.*, at 785. The claim was not lim-

ited to any special arrangement of machinery. *Ibid.* The Court said,

> "That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar, or a mill. Either may be pointed out; but if the patent is not confined to that particular tool or machine, the use of the others would be an infringement, the general process being the same. A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing." *Id.*, at 787–788.

Transformation and reduction of an article "to a different state or thing" is the clue to the patentability of a process claim that does not include particular machines. So it is that a patent in the process of "manufacturing fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure" was sustained in *Tilghman* v. *Proctor*, 102 U. S. 707, 721. The Court said, "The chemical principle or scientific fact upon which it is founded is, that the elements of neutral fat require to be severally united with an atomic equivalent of water in order to separate from each other and become free. This chemical was not discovered by Tilghman. He only claims to have invented a particular mode of bringing about the desired chemical union between the fatty elements and water." *Id.*, at 729.

Expanded Metal Co. v. *Bradford*, 214 U. S. 366, sustained a patent on a "process" for expanding metal. A process "involving mechanical operations and producing

a new and useful result," *Id.*, at 385–386, was held to be a patentable process, process patents not being limited to chemical action.

Smith v. *Snow*, 294 U. S. 1, and *Waxham* v. *Smith*, 204 U. S. 20, involved a process for setting eggs in staged incubation and applying mechanically circulated currents of air to the eggs. The Court in sustaining the function performed (the hatching of eggs) and the means or process by which that is done, said:

> "By the use of materials in a particular manner he secured the performance of the function by a means which had never occurred in nature, and had not been anticipated by the prior art; this is a patentable method or process. A method, which may be patented irrespective of the particular form of the mechanism which may be availed of for carrying it into operation, is not to be rejected as 'functional,' merely because the specifications show a machine capable of using it." 294 U. S., at 22.

It is argued that a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a "different state or thing."

We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents. It is said that the decision precludes a patent for any program servicing a computer. We do not so hold. It is said that we have before us a program for a digital computer but extend our holding to programs for analog computers. We have, however, made clear from the start that we deal with a program only for digital computers. It is said we freeze process patents to old technologies, leaving no room for the revelations of the new, onrushing technology. Such is not our purpose. What we come down to in a nutshell is the following.

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting binary code to pure binary were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

It may be that the patent laws should be extended to cover these programs, a policy matter to which we are not competent to speak. The President's Commission on the Patent System [4] rejected the proposal that these programs be patentable: [5]

> "Uncertainty now exists as to whether the statute permits a valid patent to be granted on programs. Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection, by drafting claims as a process, or a machine or components thereof programmed in a given manner, rather than as a program itself, have confused the issue further and should not be permitted.
>
> "The Patent Office now cannot examine applications for programs because of a lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent.

[4] To Promote the Progress of Useful Arts, Report of the President's Commission on the Patent System (1966).

[5] *Id.*, at 13.

> "It is noted that the creation of programs has undergone substantial and satisfactory growth in the absence of patent protection and that copyright protection for programs is presently available."

If these programs are to be patentable,[6] considerable problems are raised which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvass the wide variety of views which those operating in this field entertain. The technological problems tendered in the many briefs before us[7] indicate to us that considered action by the Congress is needed.

Reversed.

MR. JUSTICE STEWART, MR. JUSTICE BLACKMUN, and MR. JUSTICE POWELL took no part in the consideration or decision of this case.

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[6] See Wild, Computer Program Protection: The Need to Legislate a Solution, 54 Corn. L. Rev. 586, 604–609 (1969); Bender, Computer Programs: Should They Be Patentable, 68 Col. L. Rev. 241 (1968); Buckman, Protection of Proprietory Interest in Computer Programs, 51 J. Pat. Off. Soc'y 135 (1969).

[7] Amicus briefs of 16 interested groups have been filed in this case.

APPENDIX

Claim 8 reads:

"The method of converting signals from binary coded decimal form into binary which comprises the steps of—

"(1) storing the binary coded decimal signals in a reentrant shiftregister,

"(2) shifting the signals to the right by at least three places, until there is a binary '1' in the second position of said register,

"(3) masking out said binary '1' in said second position of said register,

"(4) adding a binary '1' to the first position of said register,

"(5) shifting the signals to the left by two positions,

"(6) adding a '1' to said first position, and

"(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary '1' in the second position of said register."

Claim 13 reads:

"A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of—

"(1) testing each binary digit position i, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary '0' or a binary '1';

"(2) if a binary '0' is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

"(3) if a binary '1' is detected, adding a binary '1' at the (i+1)th and (i+3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

"(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

"(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed."